Research Article

# Maternal Deaths due to Obstetric Hemorrhage in Padang, Indonesia: A Case-Control Study

## *Kematian Maternal Akibat Perdarahan Obstetri di Kota Padang, Indonesia: Sebuah Studi Kasus-Kontrol*

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## Abstract

**Objective:** To analyse the association between determinants of maternal deaths and obstetric haemorrhage in Padang, Indonesia.

**Methods:** A retrospective case-control study was conducted in Padang, Indonesia from 2015 to 2019. Maternal deaths that occurred due to obstetric haemorrhage in Padang Health Department was compared to three mothers who survived from obstetric haemorrhage (controls) in Dr. M. Djamil General Hospital, Padang, Indonesia.

**Results:** There were 20 deaths caused by obstetric haemorrhage during 2015 to 2019. Death records could only be found in 16 cases. The most common aetiology of obstetric haemorrhage was uterine atony (62.5%). Determinants associated with maternal deaths due to obstetric haemorrhage were interval between pregnancies (p=0.045; OR:10.846), history of previous labour (p=0.003; OR:8.556), and antenatal care (p=0.003; OR:21.364). Age, parity, birth attendant, and mother's educational level were not significantly associated with maternal deaths due to obstetric hemorrhage.

**Conclusions:** Uterine atony was the most frequent aetiology of maternal deaths due to obstetric haemorrhage. There was a significant association between pregnancy intervals, history of previous labour, and antenatal care with maternal deaths due to obstetric haemorrhage.

**Keywords:** determinant, obstetric haemorrhage, maternal death.

## *Abstrak*

***Tujuan:*** *Menganalisis hubungan determinan kematian maternal akibat perdarahan obstetri di Kota Padang.*

***Metode:*** *Sebuah studi retrospektif case-control dilakukan di Kota Padang dari tahun 2015–2019. Setiap kasus kematian ibu akibat perdarahan obstetri dari tahun 2015–2019 yang dilaporkan oleh Dinas Kesehatan Kota Padang dibandingkan dengan tiga kasus perdarahan obstetri yang tidak berakibat kematian di RSUP Dr. M. Djamil Padang. Analisis data menggunakan uji Chi-square.*

***Hasil:*** *Ada 20 kasus kematian akibat perdarahan obstetri selama tahun 2015–2019. Catatan kematian hanya dapat diperoleh pada 16 kasus. Etiologi terbanyak kematian akibat perdarahan obstetri ialah atonia uteri. Determinan yang berhubungan dengan kematian akibat perdarahan obstetri ialah jarak kehamilan (p=0.045; OR:10.846), riwayat persalinan sebelumnya (p=0.003; OR:8.556), dan antenatal care (p=0.003; OR:21.364). Tidak terdapat hubungan yang signifikan antara usia, paritas, penolong persalinan, dan tingkat pendidikan ibu dengan kematian maternal akibat perdarahan obstetri.*

***Kesimpulan:*** *Atonia uteri merupakan etiologi tertinggi kematian maternal akibat perdarahan obstetri. Ada hubungan yang signifikan antara jarak kehamilan, riwayat persalinan sebelumnya, dan antenatal care dengan kematian maternal akibat perdarahan obstetri.*

***Kata kunci:*** *determinan, kematian maternal, perdarahan obstetri.*

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## INTRODUCTION

Obstetric haemorrhage is the major cause of maternal death globally, responsible for about 27.1% of all maternal mortality.[1] It causes 127,000 deaths annually and mainly occurs in developing countries.[2] In Southeast Asia, obstetric haemorrhage-related maternal deaths represented 29.9% of all maternal deaths.[1] Approximately 32% of all maternal deaths due to obstetric haemorrhage occurs in Indonesia and is the primary cause of maternal death during 2010–2013.[3] The primary causes of maternal death in Padang, Indonesia from 2015 to 2019 were obstetric haemorrhage (28%).[4–6]

The most common aetiologies of obstetric haemorrhage included first trimester bleeding, antepartum haemorrhage (APH), and postpartum haemorrhage (PPH). The first trimester bleeding is a common complication in pregnancy. It is estimated that 11 to 13% of all maternal deaths are caused by abortion and 6% are caused by ectopic pregnancy.[7] APH is present in 3 to 5% of pregnancies; such condition is of tend caused by placenta praevia, placental abruption, and uterine rupture.[8] Aetiologies of PPH include uterine atony, retained placenta, genital tract laceration, and coagulopathy.[9] Approximately two-thirds of obstetric haemorrhage-related maternal deaths are classified as postpartum haemorrhage.[1]

Despite the identification of risk factors, obstetric haemorrhage is mostly unpredictable. A comprehensive understanding of the determinants related to maternal death due to obstetric haemorrhage will help medical professionals quickly identify and provide adequate care for women at the greatest risk of dying. No earlier studies, to our knowledge, have directly addressed this topic. Considering the above explanation, we are interested in doing this study.

## METHODS

This was a retrospective case-control study conducted at the Padang Health Department, Padang, Indonesia, first-line health care facilities around Padang, and Dr. M. Djamil General Hospital, Padang, Indonesia during the period of May to August 2020. The inclusion criteria were all mothers who died due to obstetric haemorrhage during 2015–2019 and were documented in Padang City Health Department. Mothers who survived from obstetric hemorrhage during 2015 to 2019 in Dr. M. Djamil General Hospital as controls. Uncompleted records were excluded from this study. Samples were collected by total sampling (cases) and systematic sampling (controls). Authors compared one case to three controls, matching with the etiology of hemorrhage.

Data were analysed by Chi-square test to find out the association between age, parity, interval between pregnancies, history of previous labour, antenatal care, birth attendant, and mother's educational level with maternal death due to obstetric haemorrhage. Data were analysed with SPSS 25.0 for Windows. P values less than 0.05 were considered statistically significant.

**Table 1.** Characteristics of Maternal Deaths due Obstetric Haemorrhage

| Variables | Case | | Control | |
|---|---|---|---|---|
| | n = 16 | % | n = 48 | % |
| **Age (yo)** | | | | |
| In risk (<20 or >35 ) | 4 | 23.5 | 13 | 76.5 |
| Not in risk (20-35 ) | 12 | 25.5 | 35 | 74.5 |
| **Parity** | | | | |
| In risk (1 or >4) | 3 | 20 | 12 | 80 |
| Not in risk (2-4) | 13 | 26.5 | 36 | 73.5 |
| **Interval between pregnancies (years)** | | | | |
| In risk (<2 ) | 3 | 75 | 1 | 25 |
| Not in risk (≥2 ) | 13 | 21.7 | 47 | 78.3 |
| **History of previous labour** | | | | |
| Spontaneous delivery | 9 | 16.9 | 44 | 83.1 |
| Cesarean and instrumental delivery | 7 | 63.6 | 4 | 36.4 |
| **Antenatal care ( times)** | | | | |
| In risk (<4 ) | 5 | 83.3 | 1 | 16.7 |
| Not in risk (≥4 ) | 11 | 18.9 | 47 | 81.1 |
| **Birth attendant** | | | | |
| Healthcare worker | 15 | 23.8 | 48 | 76.2 |
| Non-healthcare worker | 1 | 100 | 0 | 0.0 |
| **Mother's educational level** | | | | |
| Uneducated | 1 | 100 | 0 | 0.0 |
| Primary or secondary school | 1 | 8.3 | 11 | 91.7 |
| High school | 10 | 28.6 | 25 | 71.4 |
| Diploma or university | 4 | 25 | 12 | 75 |

**Table 2.** The Etiology of Hemorrhage in Death Cases

| Etiology of hemorrhage | n | % |
|---|---|---|
| Uterine rupture | 1 | 6.25 |
| Uterine atony | 10 | 62.5 |
| Retained placenta | 4 | 25.0 |
| Genital tract laceration | 1 | 6.25 |

**Table 3.** The Association between Determinants and Maternal Death due to Obstetric Haemorrhage

| Variables | Case | | Control | | P-value | OR | CI = 95% |
|---|---|---|---|---|---|---|---|
| | n | % | n2 | % | | | |
| **Age (yo)** | | | | | 1.000 | 0.897 | 0.245-3.288 |
| In risk (<20 or >35 ) | 4 | 23.5 | 13 | 76.5 | | | |
| Not in risk (20-35 ) | 12 | 25.5 | 35 | 74.5 | | | |
| **Parity** | | | | | 0.742 | 0.692 | 0.168-2.850 |
| In risk (1 or >4) | 3 | 20 | 12 | 80 | | | |
| Not in risk (2-4) | 13 | 26.5 | 36 | 73.5 | | | |
| **Interval between pregnancies (years)** | | | | | 0.045 | 10.846 | 1.040-113.165 |
| In risk (<2 ) | 3 | 75 | 1 | 25 | | | |
| Not in risk (≥2) | 13 | 21.7 | 47 | 78.3 | | | |
| **History of previous labour** | | | | | 0.003 | 8.556 | 2.063-35.481 |
| Spontaneous delivery | 9 | 16.9 | 44 | 83.1 | | | |
| Cesarean and instrumental delivery | 7 | 63.6 | 4 | 36.4 | | | |
| **Antenatal care (times)** | | | | | 0.003 | 21.364 | 2.263-201.712 |
| In risk (<4 ) | 5 | 83.3 | 1 | 16.7 | | | |
| Not in risk (≥4 ) | 11 | 18.9 | 47 | 81.1 | | | |
| **Birth attendant** | | | | | 0.250 | 0.238 | 0.153-0.370 |
| Healthcare worker | 15 | 23.8 | 48 | 76.2 | | | |
| Non-healthcare worker | 1 | 100 | 0 | 0.0 | | | |
| **Mother's educational level** | | | | | 0.171 | | |
| Uneducated | 1 | 100 | 0 | 0.0 | | | |
| Primary or secondary school | 1 | 8.3 | 11 | 91.7 | | | |
| High school | 10 | 28.6 | 25 | 71.4 | | | |
| Diploma or university | 4 | 25 | 12 | 75 | | | |

There were 20 cases of maternal death due to obstetric hemorrhage in Padang City during 2015–2019. Death records could only be found in 16 cases. The characteristics are shown in Table 1. Maternal deaths most frequently occur at age 20-35 years (25.5%), multiparity (26.5%), short pregnancy intervals (75%), history of caesarean delivery (63.6%), poor antenatal care (83.3%), delivery assisted by a non-healthcare worker (100%), and uneducated (100%) when compared to mothers who survived from obstetric hemorrhage. In this study, we found that PPH is the main cause of maternal death due to obstetric hemorrhage with uterine atony as the highest etiology (62,5%). Determinants associated with maternal deaths due to obstetric haemorrhage were interval between pregnancies (p = 0.045), history of previous labour (p = 0.003), and antenatal care (p = 0.003). Age, parity, birth attendant, and mother's educational level were not significantly associated.

## DISCUSSION

In this study, PPH was the major cause of maternal death due to obstetric hemorrhage, with uterine atony as the most frequent aetiology (62.5%). This finding is in line with a study in Madagascar and Turkey that showed 70.2% and 50.68% of all deaths due to haemorrhage were caused by uterine atony, respectively.[10,11] However, previous studies have shown varying results. In North-East India, uterine atony only occurs in around 15.98% of females.[12]

This study found that pregnancy intervals, history of previous labour, and antenatal care were significantly associated with maternal deaths due to hemorrhage. Short pregnancy intervals (<2 years) tends to increase the risk of death. The study in Nigeria and dr. Soesilo Slawi Hospital Tegal are showing the same result.[13,14] Short pregnancy intervals (<2 years) was classified as risk interval for reproductive organs due to insufficient rest periods.[13] Short pregnancy intervals is related to the decrease of maternal nutrition, thus increasing the possibility of hemoglobin level drop during labour. Existing literature has shown that severe anaemia may affect the contraction of myometrium due to diminished transport of oxygen and hemoglobin to the uterus affecting tissue enzyme and cellular dysfunction.[15]

Prior history of cesarean delivery increased the risk of death in our study. This result is similiar

to findings in previous studies in Madagascar, Senegal, and Mali.[11,16] Indications for cesarean section are already risk factors for hemorrhage from delivery.[11] Another literature finds that caesarian delivery caused greater amount of blood loss compared to spontaneous delivery. In caesarian delivery, diagnosis and prevention to further blood loss are needed, so that danger to mother's life can be averted. In order to reduce PPH and its related complications, the International Confederation of Midwives and International Federation of Obstetrics and Gynecology (FIGO) suggest active management of the third stage of labour to all parturients.[17]

Poor antenatal check-up (less than 4 times) tends to increase the risk of maternal death due to obstetric hemorrhage. Our study is in India and Madagascar.[18,11] Women who had routine antenatal check-ups can identify the risk factors of pregnancy such as age, parity, pregnancy intervals, anemia status, history of illness, previous labour history, and PPH history. The place of delivery needs to be discussed and planned according to the risk of PPH identified during antenatal care. Antenatal care could optimize the management of chronic diseases such as cardiovascular disease, which could restrict the capacity of a woman to withstand acute blood loss. Daily or weekly supplementation of oral iron with or without folic acid in pregnant women decreases the risk of anaemia at term.[19]

Maternal age was not significantly associated with maternal deaths due to hemorrhage. Our study found that women who died in productive age (20-35 years) had pre-existing anaemia and chronic energy deficiency. An emergency hysterectomy is required for dead women suffering from anaemia and severe uterine atony. However certain studies have stated advanced maternal age (≥35 years) increases the risk of obstetric complications including PPH[20] and eventually leading to death.[16]

There was no significant association between parity and maternal deaths due to haemorrhage. We found that women who died with high parity were also followed by advanced maternal age, short pregnancy intervals, and rarely had antenatal care because of their mindset of being "experienced" based on previous pregnancy and having no symptoms on current pregnancy. This study found that high parity is related to low socioeconomic status. Our study is in concordance [16,10] but the study conducted showed otherwise.[11]

We did not find any significant association

between the birth attendant and maternal deaths due to hemorrhage. The present study found almost all deliveries of dead women who were already in high-risk pregnancy and severe conditions assisted by healthcare workers. However, there was a case of death who had home delivery and was assisted by family. Studies have indicated that home delivery[18] and unskilled birth attendants[21] are determinants leading to maternal death.

Lack of education of mothers was not found to be of any significant role in maternal survival which has also been observed [18] However, their study showed that mothers and mother in-laws play a crucial role in decision making related to maternal well-being and husbands lack of education was reflected as an important determinant of maternal survival.[18]

## CONCLUSIONS

The present study reports maternal deaths due to obstetric haemorrhage are most frequently found in women at age 20-35 years, multiparity, short pregnancy intervals, history of cesarean delivery, poor antenatal care, delivery assisted by non-healthcare worker, and uneducated when compared to women who survived from obstetric hemorrhage. Uterine atony is the highest etiology of hemorrhage in death women. Significantly associated determinants are interval between pregnancies, history of previous labour, and antenatal care.

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